

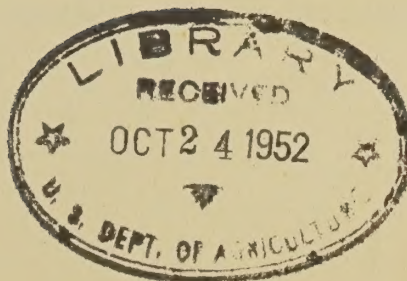
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MISSOURI, 44, GRUNDY;

FIELD APPRAISAL ANALYSIS.

Prepared by
Program Analyst
Office of the Administrator
2 U.S. RURAL ELECTRIFICATION ADMINISTRATION.

Field Appraisal
Completed in
February 1952

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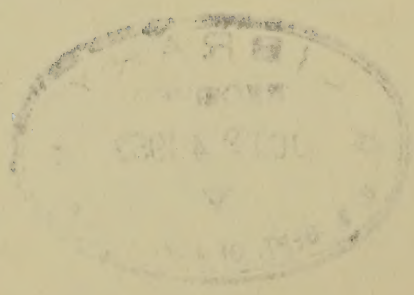


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Office of the Administrator
Bureau of Investigation
Washington, D. C.

Field Office
Organized to
January 1933



July 15, 1952

Program Analyst
Office of the AdministratorSUMMARY AND CONCLUSIONAREA CHARACTERISTICS

The population of this area has decreased by 15 percent during the decade 1940 to 1950. Livestock, principally beef cattle, provides the major source of agricultural income in the area. Farms average 173 acres. More than three-quarters of all farms are owned in whole or in part. The average value of land and buildings is approximately \$11,500. Gross income from sale of farm products averaged nearly \$3,500 for the area during 1949. Floods are expected one or two times annually on the smaller streams. Droughts of serious nature occur about one year in five. Heavy sleet storms occur one in three years on the average.

ULTIMATE NUMBER OF CONSUMERS

On January 31, 1952, this cooperative was serving a total of 5,198 consumers. The manager estimates the ultimate number of consumers to be served by this system as 5,636, or an increase of 8.4 percent. The area sample used in this appraisal provides independent data which supports the manager's estimate of the ultimate.

ESTIMATED FUTURE CONSUMPTION OF ELECTRICITY

Since this cooperative was energized in 1940, average monthly farm consumption rose from 35 kwh to 112 kwh for 1951. For farmers connected 10 or more years who were interviewed in connection with this study, consumption increased from 94 kwh in 1948 to 200 kwh in 1951. Farm consumers indicated that they expected to increase their use of electricity 44 percent by the end of 1955. Nonfarm and town residential consumers indicated a 14 percent increase to be achieved over the same period.

Four-fifths of the indicated increase is expected to occur in the household and only one-eighth in the production part of the farm and home business. Over one-half of all increased use is expected to be achieved through the connection of water heaters and freezer cabinets.

Increasing costs of purchased power and the encroachment of LP gas are serious deterrents to future use of electricity in this area. Wholesale power cost increased from 1.15¢ in 1943 to 1.29¢ in 1951, while for Missouri as a whole the trend in cost was declining. The survey revealed that more than half of the consumers were using LP gas for one or more purposes, and what is more, the trend is toward increased use of gas.

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Based on all factors believed to be significant, this analysis leads to the following estimates, which are certified as being reasonable and may be expected to be attained by the years specified.

<u>Class of Consumer</u>	<u>Calendar</u>			
	<u>Year 1951</u>	<u>1954</u>	<u>1957</u>	<u>1962</u>
Farm	112	150	185	250
Nonfarm and town residential	70	80	90	125

E. C. Weitzell, Program Analyst
Office of the Administrator

July 15, 1952

Program Analyst
Office of the Administrator

ANALYSIS OF BASIC FACTORS RELATED TO THE
RURAL ELECTRIFICATION LOAN FOR
MISSOURI 44 GRUNDY

This analysis of the probable future consumption of electricity for the Grundy Electric Cooperative, Inc., with headquarters at Trenton, Missouri, (Figure I) is based on a field study conducted by Vergil Bufford and I. Kieth Harrison, Agricultural Economists, and was completed during February 1952. The field work consisted primarily of visits to 238 served and prospective consumer units, of which 204 were served farm consumers, 9 were potential farm consumers, and the remaining 25 were served nonfarm and town residential consumers.^{1/} In addition, local businessmen, bankers, and agricultural leaders were consulted as to local economic trends and their estimates of the future for the area with respect to the use of electric power.

ULTIMATE NUMBER OF CONSUMERS

On January 31, 1952, this cooperative was serving 5,198 consumers. The manager has estimated that a total of 5,636 will be served ultimately, or an increase of 8.4 percent over those presently receiving service (Figure II). The ultimate number, according to the manager, includes consumers within the system's area boundary as well as homes presently unelectrified but now existing in the area. The manager did not indicate any additional consumers as a result of new homes or commercial development. Secondary economic information supports little, if any, development of this nature.

The random sample of consumer units developed for the survey indicated the nature of consumer units in the area with respect to electric service as follows:

^{1/} Respondents in the survey were randomly selected and comprise an area sample of approximately 5 percent of the consumer units in the system area.

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TABLE I

DISTRIBUTION OF CONSUMER UNITS
WITH RESPECT TO ELECTRIC SERVICE

Nature of Consumer Unit	Units in Sample	Estimate of Total Number of Units in Service Area ^{1/}
Farm, served	204	4,080
Nonfarm and town, served	25	500
Churches and schools (served)	6	120
Farm, potential	9	180
Served by power company	26	520
Abandoned farmstead	33	660
Vacant farmstead	19	380
Not interested in service	23	460
Total	345	6,900

^{1/} Derived by expanding sample data.

The estimates of served consumers appear to be low since the cooperative, as shown in Figure II, is now serving more consumers than the expanded sample data indicate. Part of the understatement occurs since the survey did not include a sample of commercial consumers.

Considering the 180 estimated farm potentials and the fact that an estimated 460 consumer units are presently not interested in service, though nevertheless probable future consumers to some degree, it appears that the ultimate number of consumers as estimated by the cooperative is reasonable.

NATURE OF PRESENT AND INDICATED FUTURE
CONSUMPTION OF ELECTRICITY AS REVEALED BY THE SURVEY

A tabulation of the raw data secured from the respondents revealed the following average monthly consumption figures:

TABLE II
INDICATED MONTHLY KWH CONSUMPTION^{1/}

Consumer Class	Present	Future	Percent Increase
Farm	149	214	44
Nonfarm and town residential	87	99	14

^{1/} Based on presently connected consumers.

Historical consumption records for farm consumers in the survey indicated a generally rising average consumption. Also, consumers added in recent years appear to have attained initial averages higher than consumers connected over the longer period. This is revealed in the table which follows:

TABLE III
AVERAGE MONTHLY KWH CONSUMPTION

Total number of years with electricity	Number of Schedules	Average KWH Consumption Per Month											
		1940	'41	'42	'43	'44	'45	'46	'47	'48	'49	'50	'51
12	3	30	43	55	60	63	62	74	76	81	84	111	175
11	6	---	33	42	53	59	63	65	84	116	168	212	257
10	2	---	---	26	30	35	48	47	41	49	32	82	80
9	0	---	---	---	---	---	---	---	---	---	---	---	---
8	1	---	---	---	---	23	41	51	56	58	67	61	57
7	2	---	---	---	---	---	41	58	100	164	209	262	286
6	17	---	---	---	---	---	---	77	95	108	149	183	213
5	12	---	---	---	---	---	---	---	81	101	108	139	151
4	15	---	---	---	---	---	---	---	---	57	75	82	92
3	23	---	---	---	---	---	---	---	---	---	78	114	138
2	54	---	---	---	---	---	---	---	---	---	---	76	98
1	45	---	---	---	---	---	---	---	---	---	---	---	74

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A saturation of electrical appliances and equipment, measured in terms of the percent of consumers presently having them and a corresponding percent anticipated in the future, was compiled from field schedules. The difference in saturation, as revealed by the increase in percentage points, was converted to future kwh requirements per 100 consumers for each appliance and piece of equipment. This tabulation is shown in Table IV.

TABLE IV

PRESENT AND INDICATED SATURATION OF ELECTRICAL APPLIANCES AND EQUIPMENT, AND CORRESPONDING ESTIMATED INCREASE IN KWH USAGE

Appliance or Equipment	Percent of Consumers ^{1/}		Increase ^{2/}	
	Presently Using	Indicating Future Use	Percentage Points	KWH Usage (per 100 Consumers)
Air Conditioning Unit	1	1	0	---
Air Compressor	2	2	0	---
Animal Clipper	1	1	0	---
Blanket	4	5	1	150
Broiler	1	2	1	50
Brooder, Hover	16	26	10	2,030
Clock	50	52	2	36
Cream Separator	20	23	3	105
Drill Press	12	17	5	60
Feed Grinder	0	1	1	1,850
Fence	1	1	0	---
Freezer (Cabinet)	11	28	17	15,300
Fan (Central Hot Air Cir.)	7	10	3	720
Fan (Exhaust-Kitchen)	0	1	1	15
Fan (Household)	39	41	2	30
Food Mixer	25	33	8	200
Heating Pad	22	25	3	9
Hot Plate	13	13	0	---
Iron	93	93	0	---
Ironer	2	3	1	120
Lamb Brooder	1	1	0	---
Lighting, Cave or Spring House	6	7	1	5
Dairy Barn	3	4	1	35
Fruit Packing House	1	1	0	---
Garage	7	13	6	48
General Barn	47	67	20	480
Grain & Feed Storage				
Building	17	24	7	14
Hay Barn	6	8	2	6

Appliance or Equipment	<u>Percent of Consumers^{1/}</u>		<u>Increase^{2/}</u>	
	Presently Using	Indicating Future Use	Percentage Points	KWH Usage (per 100 Consumers)
Lighting (Continued)				
House	99	99	0	---
Milk House	12	21	9	315
Other Buildings	21	25	4	48
Poultry Brooder				
House	12	21	9	45
Poultry House	22	40	18	630
Yard	79	83	4	72
Livestock Watering	8	10	2	360
Milk Cooler	0	1	1	152
Milking Machine	5	9	4	1,240
Oil Furnace	2	3	1	300
Percolator	10	10	0	---
Pig Brooder	2	2	0	---
Power Saw	5	6	1	12
Pressure System (less than 22')	11	26	15	2,700
Pressure System (greater than 22')	10	13	3	720
Radio	89	94	5	500
Range	17	21	4	4,800
Refrigerator	78	88	10	3,600
Roaster	2	2	0	---
Sewing Machine	9	13	4	40
Soldering Iron	6	10	4	60
Space Heater	4	6	2	140
Stock Tank Heater	1	3	2	300
Television Receiver	0	17	17	6,120
Toaster	63	72	9	315
Tool Grinder	9	14	5	125
Vacuum Cleaner	33	40	7	140
Waffle Iron	19	21	2	50
Washing Machine	84	89	5	175
Water Heater (house)	8	17	9	27,000
Water Heater (dairy--pour-in)	4	6	2	3,000
Water Heater (pail)	15	19	4	1,200
Water Warmer (poultry)	3	7	4	240
Welder	1	3	2	150

^{1/} Includes potential consumers.

^{2/} Based on average energy requirements determined by REA. Data do not reflect instances where more than one of the same appliance exists per consumer. These cases are rare and do not affect the over-all pattern materially.

ECONOMIC CHARACTERISTICS

There has been an approximate 15 percent decrease in population in the area during the last 10 years. Farm population decrease was larger than that of the towns. The population is predominantly native-born white.

Livestock farming provides the major source of agricultural income of the area. Including dairy and poultry, this type of farming accounts for two-thirds of all farms and 85 percent of the farm income.

The principal livestock enterprise is raising beef cattle. This is a desirable adjustment to the rolling topography and erosive soils. Much of the area is devoted to pasture and hay. Most of the cattle are sold as feeders. Although more than 6 million bushels of corn were produced in the area in 1949, it has been regarded as a grain deficit area because of the considerable demand for corn for feeding the cattle. The production of Grade A milk is increasing, especially in Harrison County. Farms average 173 acres in size and have changed little over the last 5 years. More than three-fourths of all farms are owned in full or in part.

The financial pattern of agriculture in this area indicates the average value of land and buildings per farm to be between \$11,000 and \$12,000, or 60 percent greater than 5 years ago. According to banks visited in the area, the ratio of deposits to loans was 3.4 to 1. The National Farm Loan Association located in Trenton has presently 350 loans outstanding that average \$2,500. Two-thirds of these loans were made for refinancing. The local Production Credit Association has 350 loans outstanding; a total of \$750,000 was loaned during 1951. Cashiers of the various banks report few U. S. Defense Bond purchases by farmers and many bonds cashed. This situation was believed to exist as a result of the considerable flood losses in the fall of 1950 and generally poor crops in 1951 because of too much rainy weather. Gross income from sale of farm products averaged nearly \$3,500 for the area during 1949. Off-farm employment in this area is small. Although 30 percent of the farm operators worked off the farm in 1949, only about 10 percent worked for 100 days or more.

Marketing facilities appear adequate. Large numbers of beef cattle are sold as feeders at local sales barns and trucked out to fattening areas. Some are placed on markets at Kansas City, St. Joseph, Des Moines, and Chicago. Hogs raised are almost entirely sent to these markets. Grade A milk is trucked to Kansas City daily, a distance of 125 miles. This is considered to be a long distance, and it would appear that any decrease in demand for market milk may be first felt in this area.

Railroads and highways traverse the area (Figure I). County roads are gravelled and generally well maintained. The local roads follow section lines, are seldom gravelled and are of gumbo consistency. With rolling terrain, these roads are not always passable, especially in rain or snow.

There are few natural resources in the area. Strata of coal underlie the entire service area. Small mines are in operation for the local market. Agricultural limestone is crushed at local quarries. No other minerals of commercial importance are to be found. There is little commercial timber and no important recreational area.

PHYSICAL CHARACTERISTICS

The service area is in the lower basin part of the Missouri Basin. The altitude is approximately 1,000 feet with a gradual rise toward the northwest. The topography is rolling and rather completely dissected by stream valleys. Slopes are fairly short but rather steep. Erosion processes continue at a rapid rate. The principal soils are brown and black prairie soils and silt loams along the stream bottoms. The prairie soils contain some sand and fine gravel, which aid local drainage. However, the silt loams usually require drain tiles, large open ditches, and occasional levees for successful use. The growing season averages 175 days from April 25 to October 10. Floods are expected one or two times annually on the smaller streams. Droughts of serious nature occur about 1 year in 5. Heavy sleet storms occur one in 3 years on the average.

ANALYSIS OF FUTURE KWH CONSUMPTION

Since this cooperative was energized in 1940, average monthly farm consumption rose from 35 kwh to 112 kwh for 1951. This is an increase of about 8 kwh in the average monthly usage for each year. Since the end of World War II in 1946, at which time electrical appliances and equipment were becoming generally available, there has been only a modest increase in rate of growth. Table III shows that new consumers are being added at levels of consumption at least twice that of the initial consumption of earlier consumers, and for those consumers connected 10 or more years the trend following the war was accelerated from 94 kwh in 1948 to 200 kwh in 1951.

If consumption is to increase at the rate indicated in Table II, we might expect an average farm figure of 161 kwh (112 times 1.44) to be attained in the short run (3 years). At the same time, town and nonfarm residential consumers would be expected to achieve about 80 kwh (70 times 1.14).

To reach the increase indicated above, the following specific additional kwh resulting from additions of appliances and equipment must be achieved.

TABLE VCOMPONENT EFFECT OF APPLIANCES AND EQUIPMENT
ON INDICATED ADDITIONAL USE OF ELECTRICITY

Appliance or Equipment	Additional KWH Use Per 100 Consumers	Percent of Total Additional Use
<u>Household Use</u>	<u>59,500</u>	<u>78.5</u>
Water Heater (House)	27,000	35.6
Freezer Cabinet	15,300	20.2
Television Receiver	6,120	8.1
Range	4,800	6.3
Refrigerator	3,600	4.7
Pressure System (less than 22')	2,700	3.6
<u>Production Use</u>	<u>9,320</u>	<u>12.3</u>
Dairy Water Heater	3,000	4.0
Hover Brooder	2,030	2.7
Feed Grinder	1,850	2.4
Milking Machine	1,240	1.6
Pail Type Water Heater	1,200	1.6
<u>Miscellaneous</u>	<u>6,972</u>	<u>9.2</u>
Total	75,812	100.0

From Table V it is evident that four-fifths of the increased use will need to occur in the household and only about one-eighth in the production part of the farm and home business. Further, over one-half of all increased use will be due to the connection of two appliances in the household, namely, water heaters and freezer cabinets.

Some trends that reflect an expectation of the future are shown in Table VI. In general, they indicate that the service area is developing economically at a faster rate than has been true for the State of Missouri over the last decade. If these trends continue, one might expect increased purchases of most of the items indicated as desired by area consumers. It is believed that any downward change in the economic trends reflected in the table relative to income and property values may seriously hamper the consumers attaining the appliances and equipment for which they anticipate the need. Being a beef cattle area, it is believed that the majority of the requirement indicated for freezer cabinets will be met. Even in times of more dire economic conditions, this piece of equipment would likely prove an economizer for the family. The popularity of television is also likely to

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be continued, and when available to the area, the indicated saturation would likely be met even in the face of some reversals in economic conditions. Water heaters and ranges, on the other hand, are likely to take longer to connect. Production items will only be added provided the consumer is convinced that this addition will contribute to lower costs of production.

TABLE VI
TRENDS RELATED TO THE RATE
OF INCREASE IN USE OF ELECTRIC POWER

Item and Relationship	Trend			
Average Income from All Farm Products Sold				
Service Area	\$802 (1939)	\$1,594 (1944)	\$3,397 (1949)	
State of Missouri	\$838	\$2,085	\$3,130	
Ratio of Area to State	.96	.76	1.09	
Average Value of Land and Buildings				
Service Area	\$4,343 (1940)	\$7,265 (1945)	\$11,641 (1950)	
State of Missouri	\$4,324	\$6,285	\$ 9,776	
Ratio of Area to State	1.00	1.16	1.19	
Percent Dairy Farms				
Service Area	.31 (1945)	.71 (1950)		
State of Missouri	.93	1.29		
Ratio of Area to State	.33	.55		
Cost of Purchased Power				
Missouri 44 Grundy	1.15¢(1943)	1.06¢(1945)	1.23¢(1950)	1.29¢(1951)
All Co-ops in Missouri	1.03¢	.96¢	1.01¢	.98¢
Ratio Mo. 44 to All	1.11	1.10	1.22	1.32
Average Monthly KWH Consumption Per Farm Consumer				
Missouri 44 Grundy	48 (1942)	69 (1945)	97 (1950)	112 (1951)
Two Neighboring Cooperatives	54	70	100	108
Ratio, of Mo. 44 to Neighbors.	.89	.99	.97	1.04

There are two factors that will tend to have an adverse effect upon future consumption regardless of the level of economic conditions. One is the effect of an increasing cost of power, which is shown in Table VI. The cost of purchased power to this cooperative has steadily increased, as compared to a decrease for all other Missouri cooperatives. A second

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effect is the use of LP gas. The field interviews indicated that more than one-half of the consumers are presently using gas for one or more purposes. As is indicated in Table VII, the primary use is for cooking. Lower average power cost, particularly as reflected in consumer rates, and the provision of an economic advantage of electricity over LP gas as a source of energy are essential to increased average consumption for members of this system. If these changes can be achieved, it is believed that the majority of appliances and equipment will be connected which have been indicated as desired in the short run.

TABLE VII

STATUS OF LP GAS USE, 217 RESPONDENTS
REPORTING IN RANDOM SAMPLE SURVEY^{1/}

Consumers' Position With Respect to Use of LP Gas	Number in Survey	Percent of Total
Not using and not planning to use	94	43.3
Not using but planning to use	5	2.3
Presently using	118	54.4
cooking	117	
water heating	9	
house heating	12	
refrigeration	9	
chick brooding	1	
Total		100.0

^{1/} All served and potential respondents indicating use of gas.

The following tabulation presents the estimated increase in kwh use and is based on a consideration of the survey findings and other economic data available at this time.

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TABLE VIII

EXPECTED KWH INCREASE RESULTING FROM
ADDITIONS OF SPECIFIED APPLIANCES^{1/}

Appliance or Equipment	Estimated Annual KWH Increase Per 100 Consumers in 3 Years
Freezer Cabinet	12,000
Water Heater (house)	10,000
Television Receiver	5,000
Range	3,600
Hover Brooder	1,500
Pressure System (less than 22')	1,500
Refrigerator	1,500
Feed Grinder	1,400
Dairy Water Heater	1,000
Milking Machine	1,000
Pail Type Water Heater	800
Miscellaneous	<u>3,500</u>
Total KWH Increase	42,800
Estimated Annual Increase Per Consumer in 3 Years	428
Estimated Average Monthly Increase in 3 Years	36

^{1/} Based on indications of present and potential consumers.

Applying the 36 kwh average increase per month to be achieved in 3 years (1954) to the 1951 weighted average of 107 for farm and residential consumers amounts to 143 kwh. For farm consumers, the present average of 112 is increased by 34 percent to 150 kwh, or the expected consumption to be attained by farm consumers in 1954. Nonfarm and town consumers indicated their kwh usage would increase about one-third the rate of farm consumers. Therefore, their present average of 70 is increased by 12 percent to 78 kwh, or the expected consumption to be attained by them during the next 3 years.

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In view of the data available and the foregoing analysis, it is certified that the following estimates are reasonable and may be expected to be attained by the years specified:

<u>Class of Consumer</u>	<u>Calendar Year 1951</u>	<u>1954</u>	<u>1957</u>	<u>1962</u>
Farm	112	150	185	250
Nonfarm and town residential	70	80	90	125